

COVID-19: The invisible risk to oral healthcare workers in Dentistry

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Oral healthcare workers (OHCW) include any professional who can work in a dental practice setting, for example dentists, dental hygienists, dental therapists, dental assistants and denturists. Dentistry, as a profession, faces an overall elevated risk of exposure to a wide variety of infectious diseases originating from viruses and bacteria. There are numerous pathways of potential exposure to these micro-organisms. Additionally, OHCW carry a very high risk of Covid-19 transmission as a result of face-to-face communication and close proximity during dental procedures with patients, as the oral cavity and the respiratory tract can contain and transmit Covid-19.

Based on the analysis done by the Alberta Federation of Labour, OHCW are at the top of the list of 100 occupations with the highest risk of Covid-19 exposure. Dental hygienists and dental therapists carry a 100% risk, dental assistants 97.5% and dentists 97%. Dental technologists/technicians have a 62.5% risk because they do not regularly come into contact with the patients or the aerosol generated from the patient's mouth. This major risk in dentistry for the OHCW also emanates from the dental aerosol that is generated by equipment such as ultrasonic scalers and fast handpieces. These instruments generate large volumes of aerosolised water with particle sizes that range from aerosol (starting size 0.0001µm) to splatter (50µm).

In order to place the risk of these small aerosol particles generated in dentistry in perspective, normal activities such as speaking and breathing generate 1µm particle sizes, regardless of voice amplitude. The particles generated from coughing range between 0.57-0.89µm. Sneezing produces the largest droplets of 360.1µm. Particles greater than 100µm settle quickly to the floor and other surfaces. Dental aerosol particles smaller than 50µm can remain suspended in the air for periods of 30 minutes to two hours. Because of the small size of Covid-19 (0.06-0.14µm) contained in the aerosol produced in dentistry, the OHCW can easily contract the virus if it is inhaled. It has been cited that a particle with a size ranging from 0.5µm to 10µm has the potential to enter the respiratory passages, with Covid-19 having an affinity for easily entering the lower respiratory tract.

The environment in the dental practice is also important. Studies investigating generated particles of 5µm containing Covid-19 found that the virus remains viable on plastic and stainless steel surfaces for up to 72 hours. The dental practice has a wide variety of surfaces made from different materials, so an effective floor and surface disinfection protocol is essential after every aerosol-generating procedure. This will ensure OHCW and patient safety between procedures, to prevent the dental practice from becoming a nexus of Covid-19 infection.

There are various prerequisites that OHCW need to employ in their practice to reduce the risk of Covid-19 transmission. Firstly,

an appropriate pre-procedural mouth rinse to temporarily reduce the base line micro-organism load is advocated. Isolation of the oral working area with a rubber dam device offers excellent protection to the OHCW.

Personal protective equipment (PPE) is essential to provide direct protection to the OHCW. Items including face shields, well-fitting goggles, specific respirator face masks (N95/FFP2 or N99/FFP3 without valves) and a moisture-proof gown are recommended. Replacement of disposable products and correct disinfection of the face shield and goggles are essential between patients.

The reduction of the aerosol distributed in the dental practice is another important aspect. The appropriate high-efficiency particulate air (HEPA) filtered system and correct ventilation is a key engineering control aspect. The dental chair itself plays a role in the reduction of aerosols with the high-volume evacuation (or suction) device. The minimum evacuation/suction volume required from the high-volume evacuation system is at least 300 litres per minute. The dental high-volume suction tip must be placed as close as possible to the instruments used during the procedure (such as the ultrasonic scaler or fast handpiece).

Doctors Riaan Mulder and Suné Mulder-van Staden at the Dental Faculty of UWC have invented a novel aerosol suction device in collaboration with the UWC Technology Transfer Office. A design patent has been registered and the device was extensively evaluated in the laboratory and the clinical environment during 2020. The main advantage of the device is the extra-oral functionality that increases the visual field of view for the OHCW. The device further demonstrated a greater reduction in the volume of aerosol that contaminated the OHCW compared to conventional high-volume suction tips, during the testing phase.

General practice by the OHCW pre-pandemic included primarily the use of low-volume suction alone to remove the water, blood and oral fluids from the mouth during dental procedures. The South African Dental Association (SADA) has revised the suction protocol for dentistry and advice using the low volume for the aforementioned purposes but adding the high-volume suction to remove the generated aerosol. The novel UWC aerosol suction device has shown to further reduce the aerosol, with the low-volume suction still used for its original intended purpose. The novel UWC aerosol suction device was assessed in relation to the low volume alone and the SADA protocol. The results were positive and the device has a place in the future of dentistry.



Fast Handpiece



Ultrasonic scaler

Table 1. Illustration of the efficacy of the novel UWC aerosol suction device compared to low volume alone and the SADA protocol.

Assessed parameter	Low volume suction alone	SADA protocol: Low volume plus high volume	Novel UWC suction device plus low volume
Patient chest contamination in cm ²	105	55	25
OHCW chest contamination in cm ²	357	192	133
OHCW wrist contamination in cm ²	118	71	35



Dentistry, being a high-risk activity, should use all the tools available to those who work in this field, in order to continue much-needed oral health services to patients.



There is no silver bullet, and micro-organisms will remain with us, so mitigating the risks through innovation is essential for the future safety of OHCW. The OHCW must continue to strive towards greater levels of protection in the clinical setting and maintain the highest levels of infection control strategies and techniques.

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